Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Inquiry Concerning Deployment of Advanced	)	GN Docket No. 19-285
Telecommunications Capability to All	)	
Americans in a Reasonable and Timely	)	
Fashion	)	

COMMENTS OF ADTRAN, INC.

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SUMMARY

ADTRAN welcomes this review under Section 706 as to "whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion." Unlike some of the previous Section 706 inquiries, this proceeding asks the right questions and suggests that it will conduct the analyses specified by Congress in Section 706. The Commission appears poised to assess progress in advanced services deployment to determine whether it is reasonable and timely – it is not simply asking "are we there yet?"

ADTRAN supports the Commission's proposal to use a holistic approach to analyzing the timeliness and reasonableness of broadband deployment. The examination of multiple speeds makes sense, because it provides a representative sample of what consumers view as a range of broadband service options. ADTRAN also agrees with the proposal to assess fixed, mobile and satellite broadband services separately. Even though there is some overlap, mobile broadband and satellite broadband are not currently full "functional substitutes" for terrestrial fixed broadband service.

With regard to selecting a "benchmark," while increased usage largely due to video streaming suggests that 25/3 Mbps is no longer at the "upper end" of reasonableness, nothing has changed that would alter our previous assessment that 25/3 Mbps is still an appropriate benchmark for purposes of the Commission's annual broadband deployment assessment. However, the "benchmark" is less relevant to the extent the Commission will be assessing deployment over a range of speeds. ADTRAN believes that the Commission should continue to evaluate progress in achieving deployment to schools and classrooms using the previously-adopted metrics of a short-term goal of 100 Mbps per 1000 students and staff, and a long-term goal of 1 Gbps per 1,000 students and staff. ADTRAN is concerned, however, because one of the proposed data sources does not use a technology-neutral measure of the broadband availability to schools, but instead only assesses whether fiber has been deployed to the school.

ADTRAN also supports the continued use of the Form 477 data for this year's broadband deployment report. Given the consistency with prior years' Section 706 analyses based on the Form 477 data, use in this year's assessment should provide an accurate measure of trends, even if data for specific census blocks may be overstated.

Finally, ADTRAN suggests a number of additional steps the Commission should take to help spur broadband deployment. The Commission should foster broadband within schools by expanding Wi-Fi subsidies. The Commission should also resolve the still-open USF contribution proceeding to provide certainty to funding for the broadband subsidy programs. ADTRAN additionally believes that the Commission should take a more holistic approach to its efforts to spur broadband deployment by ensuring that it takes into account how the various Commission broadband subsidy programs work (or could work) together.

In addition to steps it can take itself, ADTRAN believes there are steps the Commission can take in working with others that could help accelerate broadband deployment. These include working with the White House to ensure that its infrastructure program includes broadband, and

working with Congress with regard to creating tax incentives for broadband deployment and adoption of "net neutrality" legislation so that an open Internet is not subject to continuing shifts as Administrations change. ADTRAN also urges the Commission to work with other state and federal agencies (and the private sector) on education and training programs for consumers in order to spur broadband adoption, because higher "take rates" will also make deployment of broadband economical in more areas.

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Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion	)	GN Docket No. 19-285

COMMENTS OF ADTRAN, INC.

ADTRAN, Inc. ("ADTRAN") takes this opportunity to comment on several issues raised in the Commission's *Notice of Inquiry* regarding the Fifteenth Broadband Progress Report undertaken pursuant to Section 706 of the Telecommunications Act of 1996.[1] Under that provision, Congress directed the Commission to determine and report annually on whether during the preceding year progress has been made on delivering advanced services.[2] The *Notice of Inquiry* seeks input from the public that will help allow the Commission to answer that question. ADTRAN commends the Commission for undertaking in this proceeding an objective assessment of the fundamental question raised by Congress – are advanced telecommunications services continuing to be deployed to all Americans in a reasonable and timely fashion?

ADTRAN, founded in 1986 and headquartered in Huntsville, Alabama, is a leading global provider of networking and communications equipment. ADTRAN's products enable

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1 *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN Docket No. 19-285, FCC 19-102, released October 23, 2019 (hereafter cited as "*Notice of Inquiry*").

2 47 U.S.C. § 1302. Section 706 of the Telecommunications Act of 1996, Pub. L. No. 104-104, § 706, 110 Stat. 56, 153 (1996), as amended by the Broadband Data Improvement Act, Pub. L. No. 110-385, 122 Stat. 4096 (2008), as codified in Title 47, Chapter 12 of the United States Code. *See* 47 U.S.C. § 1301 *et seq*.

voice, data, video and Internet communications across a variety of network infrastructures. ADTRAN's solutions are currently in use by service providers, schools and libraries, private enterprises, government organizations and millions of individual users worldwide. ADTRAN thus brings an expansive perspective to this proceeding, as well as an understanding of the importance to individuals, communities and our country of robust and ubiquitous broadband. ADTRAN has been a strong advocate in Commission proceedings to help spur broadband deployment,[3] and has launched an initiative to foster gigabit communities.[4] ADTRAN shares the Commission's top goal of "closing the digital divide and bringing the economic, educational, healthcare, social, and civic benefits of connectivity to all Americans seeking broadband access."[5]

ADTRAN has participated in several of the Commission's previous Section 706 Notice

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[3] *E.g.*, Comments of ADTRAN in WC Docket No. 17-84, filed January 17, 2018; Comments of ADTRAN in WC Docket No. 10-90, filed December 6, 2017; Comments of ADTRAN in GN Docket No. 17-199, filed September 21, 2017; Comments of ADTRAN in GN Docket No. 15-191, filed September 15, 2015; Comments of ADTRAN in WC Docket No. 10-90 *et. al*., filed August 8, 2014; Comments of ADTRAN in WC Docket No. 10-90, filed March 28, 2013; Comments of ADTRAN in WC Docket No. 10-90 *et. al*., filed January 18, 2012; Comments of ADTRAN in WC Docket No. 10-90 *et. al*., filed April 18, 2011.

[4] *See, Press Release*, "ADTRAN Sets the Nation's Communities on the Path to Gigabit Transformation -- Utilities, MSOs and land developers deliver Gigabit broadband to over 350 communities," http://phx.corporate-ir.net/phoenix.zhtml?c=67989&p=irol-newsArticle&ID=2178711; http://gigcommunities.net/adtran-reaches-200-gigabit-community-milestone/ ("More than 200 communities are now able to access next-generation gigabit broadband services as a result of ADTRAN's Enabling Communities, Connecting Lives program, ADTRAN announced August 11."); *Light Reading*, August 13, 2014, "Adtran Launches 'Gig Communities' Initiative," available at http://www.lightreading.com/broadband/fttx/adtran-launches-gig-communities-initiative/d/d-id/710330. *See also*, http://www.adtran.com/index.php/broadband-access.

[5] *Notice of Inquiry* at ¶ 1.

of Inquiry proceedings.[6] ADTRAN certainly shares the Commission's and Congress' goal of universal availability of advanced services. And ADTRAN believes we are well on our way towards achieving that ultimate goal. In less than a generation, consumers have gone from the best-available wireline technology of 56 kbps dial-up modems to gigabit service to the home in thousands of markets and spreading fast.[7] Wireless carriers have built out fourth generation wireless services nearly everywhere, and those companies have begun to deploy fifth generation mobile broadband services. Satellite service now provides service at speeds up to 50 Mbps to remote and insular areas from high-throughput Geostationary satellites, with multiple proposals for much greater speeds through constellations of low-Earth orbit satellites and next-generation high-throughput satellites.

ADTRAN thus welcomes this *Notice of Inquiry*'s proposal to continue the recent use of objective analyses of the progress that has already occurred, and whether it is reasonable and timely. ADTRAN also appreciates the Commission's inquiry into what can be done to ensure

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[6] *E.g.*, Comments of ADTRAN, Inc. in Docket No. GN 18-23, filed September 17, 2018; Comments of ADTRAN, Inc. in Docket No. GN 17-199, filed September 21, 2017; Comments of ADTRAN, Inc. in Docket No. GN 16-245, filed September 6, 2016; Reply Comments of ADTRAN, Inc. in Docket No. GN 16-245, filed September 21, 2016; Comments of ADTRAN, Inc. in Docket No. GN 14-126, filed March 6, 2015; Comments of ADTRAN, Inc. filed in Docket No. GN 10-159, filed September 7, 2010.

[7] According to one recent report, all-fiber deployments were on pace to hit about 50% of U.S. households by 2025 https://www.fiercetelecom.com/telecom/all-fiber-deployments-to-90-u-s-households-achievable-by-2029-report. And according to a November 2018 NCTA White Paper:

> Taking a snapshot of today's gigabit availability shows that America can now be called a gig nation. Survey results from CableLabs show that 63 percent of U.S. homes had access to gigabit service in June 2018—which is more than three quarters of the cable footprint—and that number is expected to reach 70 percent of U.S. households by year end.

https://www.ncta.com/whats-new/charging-into-the-gigabit-future.

that progress in deploying advanced services to all Americans will continue -- and accelerate. This should not be viewed as some rote exercise mandated by Congress. Rather, it is an opportunity to take stock of where we are and how best to get to where we want to be.

ADTRAN Supports the Commission's General Approach to the Section 706 Report

ADTRAN supports the Commission's approach to fulfilling its obligations under Section 706 by taking an objective, holistic assessment of broadband deployment in the United States. In some of the previous Section 706 reviews, the Commission merely seemed intent on making a negative determination under Section 706 in order to provide themselves with legal authority to adopt "net neutrality" rules.[8] In contrast to those earlier contrived analyses on the state of broadband deployment, the current *Notice of Inquiry* proposes:

> to take a holistic view of progress in the deployment of advanced telecommunications capability and whether that progress is occurring in a reasonable and timely fashion. Taking such a holistic view of deployment requires not only that we consider one benchmark speed, but rather a range of speeds, provided over both fixed and mobile technologies, to best capture the ways Americans are using advanced telecommunications capabilities.[9]

ADTRAN agrees that such a broad ranging inquiry best serves to determine whether advanced services are being deployed on a reasonable and timely basis. Americans today access broadband service in a variety of ways, so it makes sense to review all of those, including through fixed, mobile and satellite technologies.

ADTRAN also concurs with the Commission's proposal to assess the progress that is being made towards the goal of universal availability of advanced services. As the *Notice of*

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[8] *See, e.g.*, ADTRAN Comments in GN Docket No. 15-191, filed September 15, 2015 at pp. 6-10 (the Commission appeared to be "moving the goalposts" to assure a negative finding in the Section 706 proceeding).

[9] *Notice of Inquiry* at ¶ 6 (footnote omitted).

Inquiry observes, "by using the language 'is being deployed' in section 706, Congress intended that the Commission evaluate the current state of deployment to all Americans; Congress did not ask us to determine whether each and every American is served at this moment."[10] The annual broadband deployment assessment under Section 706 ought not simply be asking, like the little kids in the back of the car, "are we there yet?" – with "there" being the goal of 100% coverage. Rather, the Commission should be assessing whether progress towards the goal of universal broadband availability is occurring at a constant, accelerating or slowing pace. The *Notice of Inquiry* proposes just such an analysis.

The Commission Should Utilize the Same Assessment Tools as Last Year

In addition to utilizing the same general framework for assessing broadband deployment as was used in last year's report, ADTRAN supports the Commission's proposal to use the same assessment tools. Continuity and consistency in the analyses allow for a more accurate comparison of the trends on which the Commission ought to be focusing. Moreover, while the Commission is developing more granular and accurate broadband deployment data,[11] that information is not yet available.

The *Notice of Inquiry* proposes to once again examine five speed metrics for fixed broadband and two speed metrics for mobile broadband (mobile LTE).[12] ADTRAN believes that

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[10] *Notice of Inquiry* at ¶ 7 (footnote omitted).

[11] *Establishing the Digital Opportunity Data Collection*, WC Docket Nos. 19-195, 11-10, Report and Order and Second Further Notice of Proposed Rulemaking, 34 FCC Rcd 7505, (Aug. 6, 2019).

[12] *Notice of Inquiry* at ¶ 9. For fixed broadband, the Commission would examine deployment of the current 25 Mbps/3 Mbps fixed advanced telecommunications capability speed benchmark, along with 10 Mbps/1 Mbps, 50 Mbps/5 Mbps, 100 Mbps/10 Mbps, and 250 Mbps/25 Mbps. The Commission would assess mobile broadband deployment for two speed metrics -- 5 Mbps/1 Mbps and 10 Mbps/3 Mbps.

these different broadband speeds provide a representative sample of what consumers view as a range of broadband service options. ADTRAN would urge the Commission to collect information on gigabit service deployment as well, with an eye towards future broadband deployment reports, when new applications and increased streaming will require even greater speeds than necessary presently. The *Notice of Inquiry* also proposes to rely on a five-year time period.[13] ADTRAN agrees that such a length of time provides a sufficient look back so as to assess trends.

The *Notice of Inquiry* also asks whether "mobile broadband should be treated as a functional substitute for fixed wireline broadband."[14] To some extent, the Commission is asking the wrong question, insofar as it is comparing mobile broadband to fixed ***wireline*** broadband. Wireless broadband can provide fixed or mobile service, depending on how the service is engineered. Broadband service providers have already begun deploying fixed broadband service using LTE and 5G technology,[15] so in that sense, "mobile broadband technology" is a functional substitute for fixed broadband service when configured to do so.

And even when configured as a mobile service, LTE can support many of the common broadband applications, including web surfing and streaming of videos. However, in light of capacity constraints, pricing policies and usage limitations, current mobile broadband services are not a perfect "functional substitute" for fixed, wireline broadband. On the other hand, although commercial deployment is only beginning, mobile 5G service should be able to provide

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13 *Notice of Inquiry* at ¶ 9.

14 *Notice of Inquiry* at ¶ 9.

15 *E.g.*, https://www.fiercewireless.com/5g/economics-fixed-wireless-from-lte-to-5g-and-what-it-means-for-verizon.

the speed (including gigabit speeds) and capacity to be a "functional substitute" for fixed, wireline broadband service. Given the limited deployment of 5G as of the year-end 2018 period under review in this year's annual broadband report, even including it as a functional substitute to fixed broadband service is unlikely to affect the Commission's assessment. The Commission should collect any information it can on 5G deployment, however, because for future assessments, the pace of availability of 5G should positively affect an analysis of whether advanced services are being deployed on a reasonable and timely basis.

The *Notice of Inquiry* also seeks comment on whether to continue using the current benchmark of 25/3 Mbps to assess whether particular broadband services count as "advanced services."[16] ADTRAN continues to believe that this is still an appropriate benchmark for purposes of this year's assessment. In its comments in the earlier Section 706 inquiries, ADTRAN observed that the 25/3 Mbps benchmark was on the upper end of reasonableness, given the statute's definition of "advanced telecommunications capabilities," the Commission's interpretation of that term, consumer adoption rates for high speed services, and consumer demand for services such as 4K TV.[17]

While increased usage largely due to video streaming suggests that 25/3 Mbps is no longer at the "upper end" of reasonableness, nothing has changed that would alter our previous assessment that 25/3 Mbps is still an appropriate benchmark for purposes of the Commission's annual broadband deployment assessment. While 4K TV purchases have been growing, they

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[16] *Notice of Inquiry* at ¶ 11.

[17] Comments of ADTRAN in GN Docket No. 18-238, filed September 17, 2018 at pp. 5-7; Comments of ADTRAN in GN Docket No. 17-199, filed September 21, 2017 at pp. 5-7; Comments of ADTRAN in GN Docket No. 16-245, filed September 6, 2016 at pp. 7-8.

still do not comprise a majority of the new television set purchases, and 4K TV content is still limited.[18] Moreover, selecting a specific "benchmark" is less relevant for purposes of the Commission's analyses, because the Commission presumably will be assessing broadband deployment over a range of speeds.[19]

The Commission also seeks comment on the framework and tools for assessing broadband deployment to schools and libraries.[20] ADTRAN believes that the Commission should continue to evaluate progress in achieving deployment to schools and classrooms using the previously-adopted metrics of a short-term goal of 100 Mbps per 1000 students and staff, and a long-term goal of 1 Gbps per 1,000 students and staff. ADTRAN is concerned, however, because the *Notice of Inquiry* proposes to rely on two data sources to evaluate deployment to schools -- EducationSuperHighway's *2018 State of the States Report* and the Consortium for School Networking (CoSN) *2018-2019 Annual Infrastructure Survey Report*.[21] One of those data sources -- the EducationSuperhighway – does not use a technology-neutral measure of the broadband availability to schools, but instead only assesses whether fiber has been deployed to

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[18] *See, e.g.*, Digital Trends, "Here's how and where you can watch the best 4K content," posted October 17, 2019, available at https://www.digitaltrends.com/home-theater/where-and-how-to-watch-4k-uhd-content/

> Flip the calendar back to 2017 and you'd be hard-pressed to find a 4K TV for less than $1,000. Now they're available for a quarter of that. Yet, despite being more affordable (and thus at the center of more home entertainment setups) than ever, finding 4K content to watch can still be a bit of a chore.

[19] *See, Notice of Inquiry* at ¶ 9. Moreover, the Commission no longer feels compelled to set a benchmark that would result in a negative finding under Section 706, because the Commission is not relying on that statutory provision for authority to adopt net neutrality rules.

[20] *Notice of Inquiry* at ¶ 13.

[21] *Notice of Inquiry* at ¶ 23.

the school. Other technologies besides fiber are fully capable of providing the necessary capacity to schools and libraries, so the Commission should recognize that the EducationSuperHighway data will undercount schools that have access to broadband meeting the short-term and long-term benchmarks.

The *Notice of Inquiry* additionally seeks comment on the use of FCC Form 477 data to assess fixed broadband service deployment.[22] ADTRAN recognizes that the current Form 477 data has flaws, and the Commission is in the process of improving that broadband deployment data.[23] Notwithstanding the potential for Form 477 to overstate broadband deployment, it remains the most comprehensive data available. Moreover, given the consistency with prior years' Section 706 analyses based on the Form 477 data, use in this year's assessment should provide an accurate measure of trends, even if data for specific census blocks may be overstated. Thus, ADTRAN supports the continued use of that data for this year's broadband deployment report.

Finally, the *Notice of Inquiry* seeks comment on the framework for assessing satellite broadband deployment.[24] ADTRAN agrees with the Commission's proposal to separately assess satellite broadband service. As the Commission recognizes, while the broad footprint of satellite transmitters provides a large area of coverage, capacity constraints limit the actual number of subscribers that the satellite broadband service provider can actually serve while still offering a robust broadband service.[25] Moreover, for Geostationary satellites, there will inevitably be

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[22] *Notice of Inquiry* at ¶¶ 16 and 18.

[23] *See* n. 11, *supra*.

[24] *Notice of Inquiry* at ¶ 19.

[25] *Notice of Inquiry* at n. 56.

significant latency issues as the signals travel back and forth to the satellite, some 22,300 miles from the Earth's surface.

The high latency affects the ability of Geostationary satellite broadband service to support important broadband applications, including:

- ***Interactive online gaming* – any interactive services, such as online gaming, that require real time or near-real time responses would be effectively unusable.**
- ***Web page loading*** -- Transmission Control Protocol (TCP) and its multistep handshake process performs poorly over long delay links due to round trip response times and higher error rates.[26] Satellite service providers use TCP acceleration or other techniques to mitigate this degradation, but these are not ideal solutions, especially for the multiple smaller connections associated with web page loading.[27] ADTRAN observes that with such techniques, the internet web-browsing experience varies widely depending on which

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[26] Most web pages are composed of a number of objects, including text, graphics, and applets. When a web page is accessed, the first object requested is the base file for the page. That file provides directions for accessing other objects. Some of those objects may point to yet other objects. Each object must be requested with a separate HTTP "Get" command and retrieved via a TCP connection. There are limits in most consumer operating systems on how many concurrent TCP connections may be opened, so only so many objects can be downloaded in parallel. Each HTTP command, and each TCP connection, generates at least one sequence of messages between the client and server that requires receipt of the previous message before the response can be transmitted. Each of these sequences requires a round trip through the network, or a "turn," to complete. As a result of this multiplier effect, where the round trip delay is above 100 ms, even infinite download speed will not reduce the average webpage download time to less than 4 seconds – the limit for "acceptable" downloading time under Broadband Forum, Technical Report TR-126, "Triple-play Services Quality of Experience (QoE) Requirements," 13 December 2006. A much more detailed discussion of latency as a component of defining broadband is set forth in ADTRAN's White Paper, "Defining Broadband: Network Latency and Application Performance," attached to Letter from Stephen L. Goodman, Counsel for ADTRAN, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 (filed June 23, 2009).

[27] https://www.slideshare.net/bjp4642/tcp-spoofing-37227528. Such techniques also limit the content that can be accessed quickly. https://corpblog.viasat.com/satellite-speeds/ :

> With Viasat Web Acceleration service, predictive intelligence makes for snappy page loading far beyond satellite internet of the past. Basically, Viasat's web acceleration servers use innovative technology to accurately "guess" what subscribers need on the web and then have those things ready to go to accelerate load times -- even before receiving a specific command from a Viasat satellite.

objects have been pre-loaded. Moreover, access to dynamic content is a key attribute of broadband access, and by definition, this type of information cannot be pre-downloaded and cached locally at the subscriber terminal.

- ***New transport level protocols*** -- Quick UDP Internet Connections (QUIC), which runs over User Datagram Protocol (UDP), may still have the same issues as non-spoofed TCP. Although introduced relatively recently, QUIC is used by more than half of all connections from the Chrome web browser to Google's servers. The Internet Engineering Task Force is just starting to consider how to get QUIC to perform well over satellite links.[28]

- ***Virtual private networks*** -- services that use Internet Protocol Security at the network level, including many VPNs, experience degraded service when subject to high latency.[29]

- ***Over the top VoIP*** – OTT VoIP and video-chat applications typically use larger frame sizes and buffers, and the traffic will not be provided priority, so these over the top applications will suffer from degraded quality when provided over high latency links. As a result, subscribers to high latency services will effectively be limited to the managed voice offerings of the satellite broadband service provider.

- ***Miscellaneous applications*** -- miscellaneous applications, including drive mapping, Citrix and other applications that rely on client software can have problems operating over high latency satellite links.[30]

While low-Earth orbit satellite constellations can eliminate the high-latency drawbacks, they are still probably several years away from implementation (and may also have the same capacity constraints). Thus, the Commission is right to consider satellite broadband as a separate category for purposes of this year's annual broadband report.

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[28] https://tools.ietf.org/html/draft-kuhn-quic-4-sat-00.

[29] https://bentley-walker.com/articles/101. Newer SSL-based VPNs, however, can be spoofed similarly to other TCP traffic, although that may limit the VPN services a high latency customer can select.

[30] https://www.vsat-systems.com/Education/Satellite-Internet-Explained/Performance/Protocols-and-applications/.

Actions the Commission Should Undertake to Help Ensure that Advanced Services are Deployed to All Americans

The *Notice of Inquiry* also asks commenters to identify additional efforts the Commission might undertake to spur broadband deployment.[31] Beyond the current subsidy programs and deregulatory efforts, ADTRAN believes there are some other steps the Commission can take that will further accelerate broadband deployment. First, with regard to broadband deployment to schools, ADTRAN would urge the Commission to re-examine the current limit of $150 per student every five years for Category-2 subsidies.[32] Broadband connections to the school at the benchmark speeds are useful only if there is also connectivity to the students within the schools. However, based on ADTRAN's experiences with the E-rate program, it appears as if the current limits are inadequate to build out reliable internal connections and Wi-Fi capabilities to connect the students.

In addition, ADTRAN urges the Commission to resolve the long-pending USF contribution proceeding[33] in order to stabilize the funding for the broadband, Lifeline and schools and libraries subsidy programs. The most recently imposed USF contribution factor of

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31 *Notice of Inquiry* at ¶ 26.

32 *Modernizing the E-rate Program for Schools and Libraries*, 29 FCC Rcd 8870 (2014)(hereafter cited as "*E-rate Reform Order*") at ¶ 86.

33 The Commission's efforts to reform the USF contribution system proceeding was begun over a decade ago. *Universal Service Contribution Methodology*, 21 FCC Rcd 7518 (2006).

25% magnifies the distortive effects of assessing the USF fees on a declining segment of the telecommunications market.[34]

Finally, ADTRAN believes that the Commission should take a more holistic approach to its efforts to spur broadband deployment. The Commission should ensure that it takes into account how the various Commission broadband subsidy programs work (or could work) together. Subsidizing fiber deployment to anchor institutions such as schools, libraries or hospitals can also make it more efficient to provide broadband services to nearby homes and businesses. Such positive externalities need to be incorporated into the Commission's broadband subsidy efforts amongst the various USF programs.

The Commission does not do so presently. For example, in the CAF auctions, the Commission awards subsidies on the basis of a reverse auction that established the lowest subsidy level for the High Cost Fund to subsidize broadband service to homes and businesses. But it may be the case that a different set of technologies would most efficiently provide broadband service to a community if the subsidies serving anchor institutions under the Schools

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[34] *Public Notice*, "Proposed Fourth Quarter 2019 Universal Service Contribution Factor," 34 FCC Rcd 8077 (Sept. 12, 2019). *See, e.g.*, Tax Foundation Special Report, "The Excess Burden of Taxes and the Economic Cost of High Tax Rates," August 14, 2009, available at https://taxfoundation.org/excess-burden-taxes-and-economic-cost-high-tax-rates:

> This report estimates the economic cost of higher tax rates, what economists often refer to as the "excess burden" or "deadweight loss" of taxes. It represents the loss in welfare over and above what people transfer to the government as taxes. Virtually every tax creates an excess burden. Taxes distort choices and steer resources away from their best and highest use based purely on economic merit. When decisions are made in part for tax reasons, economic resources are wasted. The crucial point is that the revenue the government collects understates how much worse off an individual is because of a tax.

and Libraries and Rural Health Care programs were also taken into account, along with the High Cost Fund subsidies.[35]

Moreover, the Commission's holistic approach to spurring broadband deployment should additionally take into account other government subsidy programs. Broadband subsidies are also being provided under programs under the authority of the Department of Agriculture. Health care costs, including for necessary broadband and remote healthcare services, are subsidized by various federal programs. And numerous states are subsidizing broadband deployment. A holistic approach to fostering broadband should ensure that the Commission's programs work consciously and consistently with these other funding sources to ensure that they work harmoniously and efficiently.

There are also steps the Commission can take in working with other entities that could help accelerate broadband deployment. These include working with the White House to ensure that its infrastructure program includes broadband, and working with Congress with regard to creating tax incentives for broadband deployment. ADTRAN also urges the Commission to work with Congress in the adoption of "net neutrality" legislation so that regulation of an open Internet is not subject to continuing shifts as Administrations change. ADTRAN also urges the Commission to continue working with state and local governments through the BDAC process to help accelerate broadband deployment. ADTRAN additionally urges the Commission to work with other state and federal agencies (and the private sector) on education and training programs

[35] By way of example, the winner of a reverse auction focusing solely on the High Cost Fund might be a satellite service provider, but it could actually be more efficient overall to provide broadband service to a community as a whole if the subsidized fiber-based service to hospitals, schools and libraries was also "extended" to other customers via wireless broadband.

for consumers. Such activities should help improve broadband adoption,[36] and the resulting higher "take rates" can make it more economical for service providers to deploy broadband in more areas.

Conclusion

ADTRAN welcomes this inquiry based on the intended purpose Congress set out in Section 706 to review objectively progress in deployment of advanced telecommunications services throughout America. ADTRAN believes that such an assessment will reveal significant progress, but with more work still to be done in some areas. And as explained in these comments, ADTRAN believe there are steps the Commission can take by itself, and by working with others, that will foster the deployment of broadband to all Americans. Such actions will thus well serve the public interest by ensuring reasonable and timely deployment of advanced telecommunications services, consistent with Congressional directives.

Respectfully submitted,
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[36] As the Commission explained in Chapter IX of The National Broadband Plan (https://www.fcc.gov/general/national-broadband-plan), digital literacy and demonstrations of relevance are necessary for consumer adoption of broadband. It is not simply the cost of service that deters broadband adoption.